DOCUMENT RESUME

ED 152 533 SE 024 009

TITLE An Assessment of Water Resource Education in the K-16 Curricula: Conclusions and Recommendations. The Proceedings of the Oklahoma Water Education Planning Conference, Moore, Oklahoma, October 21, 1977.
INSTITUTION Oklahoma State Univ., Stillwater.
SPONS AGENCY Delaware Univ., Newark. Coll. of Marine Studies.; National Science Teachers Association, Washington, D.C.
PUB DATE Feb 78
NOTE 53p.; Contains occasional light type

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Conference Reports; Conservation Education; Curriculum Development; *Educational Policy; *Environmental Education; National Programs; Natural Resources; *Program Development; Science Education; *Water Resources
IDENTIFIERS *Oklahoma

ABSTRACT

Reported are conclusions and recommendations from the Water Education Planning Conference held in October, 1977 in Oklahoma. The 51 participants, science educators, scientists, representatives from state and federal water agencies, and legislators, were given tasks and questionnaires concerning the national guidelines for water resource education for a K-16 curricula. Appendices of this document summarize the group, the tasks, and the data received. Conclusions of the document pertain to Oklahoma's Water Resource Education needs, goals, resources, and priorities, and to the assessment of the national marine education draft statement. Recommendations for water education in Oklahoma include: (1) establish regional water education information dissemination centers; (2) compile and assess currently available water resource education materials; and (3) Oklahoma's Water Resource Education Committee should continue to function in a coordinating leadership role. Recommendations for the national guidelines include: (1) draft document refinement should continue until guidelines for inland and coastal states are developed; and (2) the national statement of water education should reflect balance between salt and fresh water. (MR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED152533

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Ted Mills

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

OK WATER RESOURCE EDUCATION

AN ASSESSMENT OF WATER RESOURCE EDUCATION FOR THE K-16 CURRICULA

CONCLUSIONS AND RECOMMENDATIONS

TED MILLS, DIRECTOR

Water Education Planning Conference
Moore, Oklahoma
October 21, 1977

2

SE 024 009

AN ASSESSMENT OF WATER RESOURCE EDUCATION IN THE K-16 CURRICULA

CONCLUSIONS AND RECOMMENDATIONS

THE PROCEEDINGS OF THE

OKLAHOMA WATER EDUCATION PLANNING CONFERENCE

MOORE, OKLAHOMA

OCTOBER 21, 1977

Conducted by the

Oklahoma Marine Education Steering Committee

Ted Mills, Chairman

Oklahoma State University

Stillwater, Oklahoma

February, 1978

Oklahoma Marine Education Steering Committee

Buena Ballard
Southwestern State University

Martha Nell Dodson
Oklahoma City Public Schools, Curriculum Specialist

Don Kellogs
East Central State University

Larry McKinney
State Department of Education, Science Specialist

Ted Mills
Oklahoma State University

Eugene V. Smith
President, Oklahoma Scienc Teachers Association

Edward C. Stoever
University of Oklahoma

The Water Education Planning Conference was supported by a grant from the University of Delaware Sea Grant Program and the National Science Teacher's Association.

Understanding the interfaces of technology, environment, economics and people is a basic skill that both young and old must acquire. We function as part of a natural system, the earth, and as part of this system, we are ultimately subject to the limits of the system. Water resources determine some of the most important limits and water resource education teaches the implication of these limiting factors as they pertain to the human condition and the earth as a natural system.

Our nation is blessed with an average of thirty inches of rainfall per year. Of this thirty inches, about twenty-one inches return to the atmosphere through evaporation and transpiration. The other nine inches is what theoretically remains for stream flow and replenishment of ground water.

Our use of water is growing exponentially. Per capita use during the past fifty years has increased 350 per cent. It is projected that by the year 2,000, net use will be slightly below the lower limit of available usable water and near the estimated upper limit of supply by 2020.

All the rivers and lakes of the world with their loads of waste from cities and farmlands eventually empty into the ocean. The ocean is the ultimate "sink" for both natural and man-made products, and the oceans have no outlets! Evidence from around the globe informs us that our activities on land are adversely effecting the oceans--the very oceans that future generations may depend on for natural resources.

Water forms the web that ties all life together by cycling through the ecosphere. It is the earth's most important and most abundant chemical. We can survive for only a few days in its absence. Clearly, it is of importance for each generation to learn how to manage this natural resource.

CONTENTS

Introduction	Page
I. Background	1
II. Water Resources and Education, Representative Terry Campbell	2
Conclusions	
I. Oklahoma's Water Resource Education Needs, Resources, Goals, Priorities, and Action Plans	10
II. Assessment of the National Marine Education Guidelines Statement: An Introduction to Marine Education	12
Recommendations	
I. Water Education in Oklahoma	13
II. National Guidelines: An Introduction to Marine Education	13
Appendix	
A. Participant List and Demographic Data	14
B. Small Group Task Descriptions	19
1. Oklahoma and the World of Water	20
2. Marine Education Document Improvement Report	21
C. Water Education Survey Results	22
1. Ranked Data	23
2. Raw Data	26
D. Group Responses to Oklahoma's Water Education:	34
1. Needs	35
2. Resources	37
3. Goals and Priorities	38
4. Summary of Goals and Priorities	40
5. Action Plans	42
F. Materials Distributed to Participants	44

INTRODUCTION

I. Background

The Oklahoma Marine [1]Education Steering Committee supported by the Sea Grant Program has conducted an assessment of water education needs, resources, goals, issues, and persuant actions relative to K-16 Water Education at both the state and national levels. The objectives of the assessment were:

1. To determine the desirability of recommending that water education concepts and values be introduced into the K-16 curricula.

2. To determine the needs, resources, goals, priorities, and constructive actions for achieving goals identified for water education in Oklahoma.

3. To evaluate and provide input into the formulation of a national statement[2] providing guidelines for education about the world of water.

In April, 1977, seven representatives of the State Department of Education, public schools, and higher education met to consider the feasibility of cooperating in the Sea Grant Program to assist in formulating national guidelines for water education. The group discussed the relative importance of water education in the curriculum, and the format for a conference providing Oklahomans the opportunity to assist in the formulation of national and state water education guidelines. Such a conference would provide a unique opportunity for an inland state to gain input to the formulation of national policy. At this time, the Oklahoma Marine Education Steering Committee was formed and given the charge of conducting the 1977 Water Education Planning Conference. The overall purpose of the conference was to use the combined talents of Oklahomans concerned with water resources and education to assess current curricula and to formulate and recommend water education plans.

[1]Marine, as used here, incorporates all of the earth's waters regardless of its physical state or geographic distribution.

[2]An Introduction to Marine Education: To Inform Americans About the World of Water by Harold L. Goodman. (For examination copy write Natural Resources and Environmental Education Center, College of Education, Oklahoma State University, Stillwater, OK. 74074).

The origin of this document is the Water Education Planning Conference held on October 21, 1977. Fifty-one science educators, scientists, representatives from state and federal water agencies, and legislators (Appendix A) met at Moore High School and addressed themselves to the three previously stated conference objectives. Prior to attendance, participants were mailed An Introduction to Marine Education with instruction to critique the document. Following opening remarks concerning Oklahoma's water resources and education by Representative Terry Campbell, conferees were assigned to six heterogenous, task-oriented small groups. Each independent small group performed similar tasks (Appendix B) and stated group concensus in written form. At the termination of the conference, participants completed a questionnaire concerning the national guidelines statement and curricula dealing with the world of water in general. Conclusions contained in this document were derived from the data supplied on the group report forms and the questionnaire. The data summarized in Appendix C and D represent the input of the conference participants.

II. Water Resources and Education
Representative Terry Campbell

I really appreciate this opportunity to speak at this conference on water resource education. We never have the time to do this in real depth in the legislature so this opportunity is real exciting for me.

What I would like to do is present background information on water in Oklahoma and state what I think Oklahoma needs to do to develop the water resources that we currently have. My remarks will be from the viewpoint of a consultant for natural resource development. This approach is necessary if we are to wisely develop water resources in the State of Oklahoma.

I became involved in water-related issues a couple of years ago, while a member of the House Committee on Water Resource Development. At this time, I took issue with the Water Resources Board and have been very interested in water resource management since then.

As you all know, there is a real controversy dealing with water resource development. There are some people in the state who are advocating that we transfer water from southeast Oklahoma to southwest Oklahoma, estimated to cost about $1,700,000,000. These funds would be used to develop a canal system coming across southern Oklahoma, transfering water for irrigation purposes to the southwestern part of the state. It would involve additional dams in Eastern Oklahoma to impound the water, more lakes in Western Oklahoma to hold the water, and a water pipeline to Oklahoma City to meet additional growth demands.

There is also a plan to transfer water to northwest Oklahoma from northeast Oklahoma.

A sandstone formation, an aquafer, in the Oklahoma Panhandle has provided water for irrigated grain farming in the Panhandle for the last twenty to twenty-five years. Cattlemen built cattle feed lots because of the grain availability. As the number of cattle being fattened in feed lot operations increased, Swift and a number of other companies built packing plants in the Panhandle to process beef.

Thus, the economy of the Panhandle of Oklahoma is based on water and the natural gas used to run the irrigation pumps that bring up the water. One of the serious problems, however, is that the water table in the panhandle is being depleted and it is anticipated that, in another fifteen to twenty years, the water table will have dropped so much that farmers will not be able to afford to bring it up, based on future increases in the cost of natural gas. This explains the impetus for exploring the concept of transferring the water from east to west.

In addition to the water transfer concept, I think that we need to consider other water resources, such as the rivers coming through Oklahoma, whether it be the Cimarron, the North Canadian, or the South Canadian. Thus, one proposal is to construct a dam on the Cimarron River and then move the water around the salt deposits near Freedom, Sand Springs and Buffalo via a canal, for eventual storage in Keystone Reservoir near Tulsa. But, farmers in the Panhandle are asking why we should transfer water clear back to the Panhandle, when we can just put a dam on the Cimarron and distribute it throughout Northwest Oklahoma. That makes a lot of sense! Then we wouldn't have to build a transfer system.

We have large underground water resource in Central and Eastern Oklahoma, but have not done much in determining its extent. Could Central Oklahoma develop and rely on ground water more than in the past?

With that background of where we have water in Oklahoma and what is being done in terms of water resource development today, I would like to present an economic approach to water planning. I believe the public will require a great deal more education in terms of the economics of natural resource development. What we have in Oklahoma at this time is water resource development based on political decision making rather than economic decision making. In other words, whoever has the "political stroke" in the state are the folks who are going to get the water; and those who don't have as much influence are not going to get the water resource development--and that's what it's all about.

Eastern Oklahoma is hanging back in terms of water resource development. They know they have plenty of water, and the talk that Eastern Oklahoma does not have enough water is just a smokescreen. I think the real issue is that if Oklahoma is going to spend $1.7 billion to $2 billion to develop water, Eastern Oklahoma wants a part of that money. They do not want to be left out because they are going to be just as responsible for the economic burden of that $1.7 billion. As long as they are going to be sharing the financial responsibility, they want a piece of the action.

We have water in Oklahoma, but we also have distribution problems. So, when we talk about water resource development in the State of Oklahoma, we must talk about the entire state and not just a particular segment of the state.

The next question is "where are we going to get the $1.7 billion to develop the water transfer proposal? Who and how is it going to be paid back?" No one has really answered these questions. Phase I of the Oklahoma Comprehensive Water Plan document deals primarily with water transfer in the State of Oklahoma, but there is only one page of economics on water transfer. I just completed an economic analysis project on a proposed coal mine development in Eastern Kentucky and it took thirty pages of economics to develop a $9 million project. In Oklahoma's Phase I Water Plan, we have one page of economics for a $1.7 billion project. This is where our problem begins.

One recommended role of education is to educate the public on decision making processes. This is true not only with regard to water resource development, but any other natural resource development project, whether it is coal, water, industrial minerals, natural gas, or oil.

It's not only the public, but also the politicians you have to educate. It can be done, but it is going to take time and we do not have a lot of time. Your meeting here today is a step toward developing a concept of what it is going to take to get across to the public what needs to be done.

In order to determine where and what the real priorities are in water resource development, we have to look to the economics of development to determine where the best payoffs are for the state of Oklahoma. Spending $1.7 billion to transfer water to the west may not be as big an economic payoff as developing water resources in a different manner.

It is important that the public have input into the process, rather than having politicians make the decisions based on the current political power structure in the state. If our decisions are based on political power, we are going to make some wrong decisions. When we are talking about the future of Oklahoma, it is really important that we make the best possible decision because we only get one shot at it. When you spend this much money and make a mistake, you are not likely to get a second chance. We had better be right or as close to right as possible the first time around.

Economic decision making is a pretty involved process. We have to start educating the public on how it is done so that we can use a better decision-making procedure. What we have now is a Corp of Engineers that has decided on a plan to transfer water to Western Oklahoma. The Corps has a special interest in doing this, because they plan to transfer water to Wayne, Oklahoma and then the Bureau of Reclamation takes the water on westward. The decision-making process in this project was nebulous.

When it comes to transferring water to Western Oklahoma, the farmers are going to have to pay for the water in terms of larger crop yields resulting from increased irrigation of their crop lands. I don't think we have really calculated what it is going to cost to transfer water and the increased yield we can expect from irrigated croplands. In Oklahoma City the current lower water rates averaged with the higher water rates resulting from transporting water from Southeast Oklahoma, will average out. The people have to have water, so they will pay for it. They will pay whatever it takes to secure water. But in the Southwest, it is a different game. Farmers will have to invest a lot of money in irrigation equipment. When added to the cost of bringing water to their land, this water transfer plan becomes quite expensive. When it gets down to putting figures on paper, they may have second thoughts on how bad they really want to irrigate.

What is needed is to look at all the alternative ways we can use the water resources we have in the state. We have made a good start in determining where the water is and how much we have. However, we have not done much to determine where we can best utilize that water. What is needed is an economic analysis of the increased benefits we can expect from different types of water resource development plans for the State of Oklahoma.

Right now, we have one water plan based on what the Corps of Engineers and the Bureau of Reclamation think is best from their perspective, not necessarily from Oklahoma's. They like to build canals, dams, and lakes. That is what they are in business for and they have been doing it for over one hundred years.

What we need in Oklahoma is to determine those places that need water and the economic payoff to the state of bringing water there. If we brought water in to a location, what would the economic payoff be year by year? The incremental cash flow resulting from an investment in a particular water project would be determined. For example, assume an agricultural irrigation project yielding 15 percent increase in crop yields over the next 20 years. What is that increase worth in terms of net income? What is that increase worth, not only to the farmers in the area, but to the state in terms of increased taxes? After answering these questions, we would determine the capital investment necessary to get the increased net income, discount the net income over the life span of that project, add 10 percent and then compare the discounted net income to the capital investment.

What I mean by discounting is that there is a time value to money. A dollar today is worth more than a dollar next year which in turn is worth more than a dollar a year after that. There are tables set up to discount cash flows, depending on what discount rate you want to use, whether it's 5 percent, 10 percent, or no-percent, etc.

The only way to compare projects to determine which are best for Oklahoma is to come up with a net present value estimate for each project using some standard discount rate. For example, let's use 10 percent. We would discount the incremental cash flow for the next twenty years, since, after the twentieth year, a dollar twenty years from now is worth about a penny today. The capital investment required, would also be discounted because the project may take four or five years to develop. When you do that for all proposed water development projects across the state, you can compare the net present values (adding the net present value of the incremental income and substracting the net capital investment.) This is the best way to determine priorities in terms of which projects to develop.

If we wait on the Federal Government for the money to develop water resources in Oklahoma, we could be dried up and blown away by the time they get around to making a decision. What we must do is figure out how to finance water resource development without putting our future hopes on the Federal Government for decisions and funds. This is the type of decision-making that has to be made in the State of Oklahoma.

It takes time to educate the public in water resource development and economic decision-making and get the process out of the hands of the politicians and those people who have a special interest. I think

the public will understand quickly, because they will be putting up the money. The public needs to keep Oklahoma's future in mind. They need to know how we can best develop water resources in the state and should demand a rational basis for developing our water resources. For example, it may be better to dam the Cimarron River in Northwest Oklahoma rather than transfer water from Northern Oklahoma. Perhaps Tulsa needs to determine an alternative to the Cimarron River as a water source.

Another alternative might be weather modification. We could spend $2 million a year to modify the water sufficiently to bring another 10 or 15 percent more rainfall to the Panhandle and Northwest Oklahoma. The only problem is that there is a little area in Western Oklahoma that would be flooded out if they received any more rainfall. We must consider these factors.

The Southwest may have to consider a different kind of farming to justify irrigation, such as truck farming, rather than the traditional wheat farming.

With wheat prices at $2.00 a bushel, I can guarantee that they cannot justify irrigation in the Southwest. The water plan assumes high what prices that never drop. I think many farmers counted on convenient high wheat prices but found out that commodity prices do drop. In a couple of years, I am sure that prices will be back up to $3.00, $4.00 or maybe $5.00 a bushel, but will drop off again. That is the way commodity prices cycle. In the past, the problem has been that many economic decisions were based on the price of wheat holding constant. If farmers are basing all their irrigation investment decision-making on a price of $5.00 a bushel and the price of wheat drops down to $2.00, they will say, "Hey, I can't afford to irrigate," and just who is going to pay for the water transportation system now? Are all Oklahomans going to be responsible? Are we going to have to make up the difference? We need to determine what projects are the best, given the worst possible economic conditions, make priority decisions based on this information, and then implement high-priority water development projects.

There are some things I would like to point out concerning the document, An Introduction to Marine Education that tie in with the ideas I am sharing with you today. On page one, about the middle of the page, it states that the resources of the land are dwindling. Fifty years ago, people thought this country would run out of copper in ten years, but today there is a surplus because the economics have changed. Copper mines are shutting down due to the surplus. Why? Because every time the price of copper does go up a little bit, vast new reserves of low grade copper ore become commercially viable. As you keep raising the price of copper, it brings on more and more reserves. Copper shale, six inches to a foot thick, was being mined in Southwestern Oklahoma when the price was high enough. When the

price of copper dropped, the mines shut down. They will reopen when the price once again increases.

The idea that a resource is dwindling must be checked out carefully. What should have been stated is that the resources are going to cost more to get, but that they are not necessarily dwindling. Take natural gas for example. There are two ways of viewing natural resources. Some people look upon resources as an inventory clerk, stating that there is a finite amount of natural gas in this country today, which will run out in five or ten years. Studies indicate, however, that if the price of natural gas was to rise to a certain point, we would have more natural gas available than coal.

It is the same with water, when defined as a commodity with finite limits. At today's prices, there is a defined limit on the amount of water we have. But as the value of water goes up, the quantity of water available goes up also. It is not just a fixed amount. There is a lot of salt water underground that could be processed if the price is right and the same holds true along the seacoast. To say there is a defined limit on a natural resource is not necessarily a correct statement. There is an unlimited amount if you want to pay for it.

There is also an assumption in An Introduction to Marine Education that only government can make the decisions for water resource management. In many cases, economics will determine the best water resource development, not government. For example, land owners in the Panhandle made their own decision a long time ago to develop water resources at their expense. Perhaps this will eventually be done in the Southwest and in other areas where plans for water resource development are being made.

The private sector can make better decisions over the long haul than government can. If government makes a wrong decision on water resource development it could have a real impact. By contrast, if you have decisions made by fifty water resource development groups and one or two of them are wrong, you are not necessarily going to hurt the entire state.

One question that needs to be raised in preparing water resource policy statements is how much of a role do we want government to have in water resource development. Can the private sector really make better decisions? They have an economic incentive to make better decisions and they are the ones who will be the risk takers. If the government sector makes the decision, the public becomes involved in the risk taking. Do we really want to put that much of a burden on the public, higher taxes to pay off the bonds?

In summary, what needs to be done in terms of the public education is to teach the decision-making process and its use in evaluating water resource development. First we need to define the problem. If you do not define the problem correctly, everything else is wrong.

Define the problem, and look at alternative ways of solving that problem. Analyze the economics of alternative water resource development plans, then rank them in priority to determine which ones make the best investments.

Look at all the consequences of each alternative. Government has a bad habit of making a decision and not realizing the side effects.

What made this country great to begin with is the economic decision-making process that we have used for two hundred years. By and large, we have made the best possible decisions on developing this country. I would rather disburse the decision-making process and get more input, so that we can come up with the best economic decisions rather than political decisions.

CONCLUSIONS

I. Oklahoma's Water Resource Education Needs, Resources, Goals, Priorities, and Action Plans

A. The highest priority water education goal to achieve in Oklahoma is the creation of regional water resource education information dissemination centers.

During the 60's and 70's the unprecedented accumulation of information concerning people and their environment has created numerous problems for those concerned with education. It has become a struggle for public school teachers, administrators, and public and private service groups to meet the growing demand and need for public awareness of water resource issues.

The multidisciplinary nature of water resource education creates for all individuals a massive problem, often asking them to function beyond their current level of expertise.

The concensus of the six task groups indicated that the educators, administrators, legislators, and representatives of state and federal water agencies perceived the most important goal was the creation of centers for the purpose of (1) dissemination of human and material resources, (2) teacher training, (3) development of regional field study sites, and (4) coordination of a traveling water education program (Appendix D-4).

Second and third priority goals were teacher training and the development of K-12 multidisciplinary water education curricula respectively.

B. It is imperative that the K-16 curricula include water resource education concepts and values and reflect past, current, and potential future studies pertaining to the earth as a water planet.[3]

Oklahomans are constantly being faced with social, technological, economic, political, and public health decisions concerning the quantity and quality of water resources. The importance of educating the next generation to cope with these issues is of paramount importance.

[3]The conferees considered the inclusion of water-related concepts and values as an integral part of science, social science, and aesthetic components of existing curricula and not as an additional isolated "subject".

Diverse ecosystems and unequal population distribution in Oklahoma contribute to a variety of viewpoints and alternatives for water resource management.

It is becoming increasingly clear that water resources will be the limiting factor governing the future growth and quality of life in the state of Oklahoma.

Of twelve water education curricula statements (Appendix C-1) the three that conferees had the highest tendency to agree on were:

1. America needs a society knowledgeable about water.

2. Water studies should receive adequate attention in the education of teachers of all school levels and in all school subjects.

3. Our future requires changes in content emphasis in the schools to include knowlege and understanding of the earth as a water planet.

In addition, 93 percent of the conferees believe that inland states have as great a stake in the world of water as do coastal states. There was an overall concensus that Oklahoma's educational system take a hard look at curricula relative to water.

C. The most critically needed classroom resources necessary for integrating water resource education into the curriculum are multidisciplinary curricula materials and audio visual resources.

There is an apparent lack of classroom resources, i.e., lessons, units, fact sheets, and lab activities available or educators are not aware of their existence.

When specifically asked what resources they felt necessary to help integrate water resource topics into their curriculum, the most often mentioned was printed and audio-visual resources (Appendix C-2).

D. Given the necessary resources and training, Oklahoma educators are willing to assume the responsibility for implementing water resource education in the schools.

The overall positive reaction of participants to the conference indicates an awareness of the importance of the issue under consideration. Conferees expressed high interest in conducting workshops, conferences, and in writing curriculum materials (Appendix C-2). On anonymous

questionnaires asking the educators at the conference how they personally viewed the prospect of integrating the world of water into the curriculum, all responded that they would accept or accept and enjoy water related concepts in the curriculum (Appendix C-2).

II. Assessment of the national marine education draft statement:

An Introduction to Marine Education

A. There is a critical need for a national effort to increase public awareness and knowledge of water resources including all the waters of the earth.

The Oklahoma conferees, representing an inland state, exhibited a national perspective relative to marine education concepts and values. The interdependence and interrelationship between all the earth's waters was an acceptable premise for conceptualizing water-related studies. Conference participants indicated an awareness of a national priority for public education in the area of water resources.

B. An Introduction to Marine Education with modifications is an acceptable guideline for water education in an inland state such as Oklahoma.

Overall, there was acceptance of the document (Appendix C). The chapter by chapter assessment accomplished during the conference is too detailed and voluminous to report here.[4] The major points with which conferees took issue were (1) the term "Marine" education as not communicating the essence of education pertaining to all the earth's waters, (2) the relative emphasis placed on salt water, and (3) insufficient economic and ecological emphasis.

[4]Upon completion, copies of the revised An Introduction to Marine Education may be obtained by contacting members of the Oklahoma Water Resource Education Steering Committee.

RECOMMENDATIONS

The following recommendations reflect the concensus of participant input to the 1977 Oklahoma Water Education Planning Conference. The recommendations provide guidelines for the enrichment of the K-16 curriculum with concepts and values associated with the world of water.

I. Water Education in Oklahoma

A. Establish regional water education information dissemination centers.

B. Design and conduct multidisciplinary teacher education programs at the undergraduate, graduate, and leadership levels.

C. Develop multidisciplinary curriculum guides for schools appropriate for grades K-12 and community service groups.

D. Compile and assess currently available water resource education materials.

E. The Oklahoma Water Resource Education Committee should continue to function in a leadership role to coordinate the above activities.

II. National Guidelines: An Introduction to Marine Education

A. Refinement of the draft document be continued until it provides guidelines acceptable to inland as well as coastal states.

B. The term "marine education" should be replaced with a term which better communicates the essence of education pertaining to all the earth's waters.

C. A national statement guiding water education activities should reflect a balance between salt and fresh water emphasis.

APPENDIX A

Participant List and Demographic Data

APPENDIX A

Participant List and Demographic Data

1. Occupation (100% employed in Oklahoma)

Teachers	27
School Administrators	2
School Board Member	1
Legislators	2
State, Federal & Private Agencies	13

2. 80% of participants were native to Oklahoma

3. Sex

Male	31
Female	14

4. Age

20-30	7
30-40	18
40-50	9
50-60	3
60+	2

5. Education Level

BS/BA	12
MS/MA	24
Ph.D.	4
Ed.D.	1

Water Education Planning Conference
Participant List

Name	Address	Position
Kenneth Absher	Box 370 Cement, OK 73017	Administrator - Teacher
Rex D. Ackerson	1104 Cherry Altus, OK 73521	Chemistry Instructor
Alan Baharlou	Phillips University Enid, OK 73701	Faculty
Nancy L. Bohler	604 S. Prairie Okmulgee, OK 74447	Science Department Chairman
Jane Burris	7455 E. 69th St. Tulsa, OK	Science Teacher
Sid Caperton	Tishomingo High School Tishomingo, OK 73460	Science Teacher
LaWalta Class	824 N. Oakwood Enid, OK 73701	Elementary Teacher
Mark Coleman	N.E. 10th and Stonewall Oklahoma City, OK	Ass't Deputy Commissioner for Environmental Health Service
Samuel Combs, Jr.	801 W. 4th Stillwater, OK 74074	Soil Conservationist
Ben Crockett	912 E. 4th Cushing, OK 74023	Science Teacher
Dr. Bernice Crockett	625 Fidelity Plaza Oklahoma City, OK 73102	Oklahoma Water, Inc.
Jerry Crowley	4704 E. 5th Place Tulsa, OK 74112	Science Teacher
Ed Curtis	EOSU Wilburton, OK 74578	Director, Adult and Continuing Education
Charles Dvorak	Yale High School Yale, OK 74085	Teacher
Juanita Dvorak	Yale High School Yale, OK 74085	Teacher

Wayne Epperson	Box 6371 Lawton, OK 73505	Assoc. Prof. of Biology
Donald A. Flasch	P. O. Box 61 Tulsa, OK 74102	Corps of Engineers
Joe Fox	302 E. Iowa Walters, OK 73572	Science Teacher
Buel Garvin	1728 Sunset Drive Altus, OK 73521	Biology Teacher
Everett Grigsby	NEOSU Tahlequah, OK 74464	Chairman, Division of Natural Science and Math
Debbie Hardie	P. O. Box 474 Sapulpa, OK 74066	Science Teacher
Tom Hardy	3000 Pershing Blvd. Oklahoma City, OK 73107	Oklahoma Science and Arts Foundation
Bob Hess	6900 S. Byers Oklahoma City, OK 73149	Principal
Larry Hicks	Box 911 Edmond, OK 73034	Science Teacher
Dr. Scott Hopkins	Cameron University Lawton, OK 73401	Assistant Professor
Dean Hubbard	P. O. Box 325 Cherokee, OK 73728	Science Teacher
Jolene Ingram	2500 N.W. 63 #85 Oklahoma City, OK 73116	Teacher
James Ingram	201 N.W. 3rd Oklahoma City, OK 73012	U.S. Geological Survey
A. Calvin Johnson	818 E. Elm Enid, OK 73701	Geology Major
J. Rodney King	1716 Linwood Oklahoma City, OK	Teacher
Helen Kodesh	1919 W. 41st Street Tulsa, OK	Teacher
Dale C. Long	P. O. Box 189 Oologah, OK 74053	Science Teacher
Charles J. Mankin	830 Van Vleet Oval Norman, OK 73019	Oklahoma Geological Survey

Senator James McDaniel	Oklahoma Legislature	Senator
Doyle Ray McMurry	Box 278 Clinton, OK	Science Teacher
Raymond Mirtz	3300 Sunvalley Midwest City, OK	Physics & Algebra Teacher
Robert Moore	610 W. Chisholm Kingfisher, OK	K-8 Science Coordinator
Bud Osborne	Rt. 1 Box 124 B Stillwater, OK 74074	Science Curriculum Coordinator
Earlene Parr	607 W. Rickenbacker Midwest City, OK	Curriculum Specialist
Jimmie Pigg	Moore High School Moore, OK 73160	Science Coordinator
Carol Ross	20 State Capitol Oklahoma City, OK 73105	Oklahoma Conservation Commission
Dr. M. L. Rowe	East Central University Ada, OK 74820	Environmental Science
Ben Sanders	Johnson Route Box 7-A Pawhuska, OK 74056	Principal
Terry Shaw	2416 N. Starr Drive Stillwater, OK 74074	Science Teacher
Alicia Smith	Rt. 2, Box 572 Sand Springs, OK 74063	Teacher
Ted Smith	P. O. Drawer 100 Mannford, OK	Science Supervisor
Paul Southwick	1718 N. Key Guymon, OK	Biology Teacher
Joann Stuever	7316 Crown Point Rd. Hefner, OK	Science Teacher
Sherry Tipps	700 Cedar Court Cleveland, OK	Department Chairman Science
Bill Watkins	1417 N.W. 107 Oklahoma City, OK	Biology Teacher
Johnny Weaver	Rt. 2, Garner Addition Tahlequah, OK	Science Department Head

APPENDIX B

Small Group Task Descriptions

APPENDIX B

1. Oklahoma and the World of Water

Small Group Report Form

The outcomes from your group's discussion should be compiled and reported on one report form. This one summary report should be given to the conference secretary.

TASK 1

State in writing at least 5 Marine Education needs for Oklahoma's K-16 students.

TASK 2

Identify and list at least two existing or potential resources required to meet each of the needs identified in Task 1.

TASK 3

Considering the needs and resources identified in Tasks 1 and 2, state at least 3 goals Oklahoma's educational leadership should strive to achieve. Using numeral 1 to identify the highest priority goal, number each stated goal in order of priority.

TASK 4

Select one (or more) of the goals from Task 3 and develop a plan of action by which you believe the goal could be achieved. You may wish to divide the group into sub-groups allowing consideration of more than one goal at a time.

2. An Introduction to Marine Education

Document Improvement Report

Each group should select a chairperson and recorder. One summary report form per group should be submitted to the conference secretary.

You may wish to have each person work independently and individually record their reactions and then discuss the results. The one final report form submitted by the group might express group concensus and or disagreement.

The attached statements denote the major headings in the text of An Introduction to Marine Education document. In the space following each statement record group reactions i.e., revisions, acceptance, additions, rejections and strong or weak points.

The report does not have to be "fancy" just readable!

Good luck!

I. An Introduction to Marine Education

II. Definitions

III. Goals

IV. Conditions Calling for Marine Education

V. Marine Education: A Rationale

VI. Preliminary Assumptions of Marine Education

VII. Marine Education Essentials for Implementation

VIII. Conclusions

APPENDIX C

Water Education Survey Results

APPENDIX C

WATER EDUCATION SURVEY RESULTS

1. Ranked Data

a. Reaction to draft document, An Introduction to Marine Education

To evaluate the overall marine education statement, conferees were asked to underline the words or phrases that represented their opinion. Reaction to the survey items are reported as percent of those responding:

1. Overall the statement is: too strong - 9%
   about right - 81%
   too weak - 10%

2. I would give marine education, as described in the statement, a priority that is: high - 38%
   moderate - 60%
   low - 2%
   zero - 0%

3. If marine education programs are to be initiated, the level at which they should begin is: federal - 12%
   state - 28%
   local - 47%
   all - 13%

4. Regarding my own attitude about the importance of the world of water, the effect of the statement is: significant - 54%
   moderate - 33%
   minor - 10%
   zero - 3%
   negative - 0%

5. To say that inland states have a stake in the world of water equal to coastal states is: accurate - 93%
   overstated - 7%
   nonsense - 0%

6. As an educator, the prospect of integrating the world of water into the curricula is something I would personally: accept - 33%
   enjoy - 67%
   ignore - 0%
   dislike - 0%
   resist - 0%

7. Use of the term "marine" to embrace the whole world of water: is acceptable - 10%
   is troublesome - 40%
   is unacceptable - 41%
   needs to become more familiar - 9%

8. The best place, or places, for education about the world of water is:

K-12	- 20%
6-12	- 0%
undergraduate	- 0%
graduate	- 0%
continuing education	- 2%
4H, Scouts and similar groups	- 0%
all of these	- 78%

b. General Reaction to Marine Studies Curricula

The following twelve items are listed in order of the tendency to agree with the statement. The mean response is reported to the left of the statement:

Agree	Neutral	Disagree
1 2 3	4	5 6 7

1. 1.46 America needs a society knowledgeable about the world of water; a marine literate society.

2. 1.84 Marine studies should receive adequate attention in the education of teachers of all school levels and in all school subjects.

3. 1.88 America's future requires changes in content emphasis in the schools to include knowledge and understanding of the water planet.

4. 1.886 Marine studies should be infused into existing curricula rather than treated as separate topics.

5. 2.02 Marine studies are just as important in the social sciences and humanities as they are in the natural sciences.

6. 2.04 School curricula are inadequate in terms of world of water concepts.

7. 2.18 Americans in general fail to appreciate the pervasive influence of the world of water in every major facet of human life.

8. 2.24 America needs corps of marine competent professionals, technicians and workers.

9. 2.27 A new urgency for marine education exists today.

10. 2.33 Our concept of the nation must be extended to include the 200-mile economic zone, the coastal zone, and the continental shelves.

11. 2.34 Knowledge of marine careers should be part of the information guidance counselors have for advising.

12. 2.51 Specialized marine education for various purposes, or to meet local and regional needs, should be in addition to general studies about the world of water in the total education process.

c. Resources believed necessary to integrate marine topics into Oklahoma's water education curriculum (Appendix C) listed in order of frequency mentioned.

1. Printed and audio visual resources.

2. Teacher training.

3. Consultants from college, state, and federal agencies.

4. Laboratory equipment.

5. Funds.

APPENDIX C

RESULTS - RAW DATA

2. Survey Results - Raw Data

I.

Agree	Neutral	Disagree
1 2 3	4	5 6 7

1. America needs a society knowledgeable about the world of water; a marine literate society. 1-31 2-7 3-7

2. America's future requires changes in content emphasis in the schools to include knowledge and understanding of the water planet.
1-19 2-14 3-10 4-2

3. America needs corps of marine competent professionals, technicians and workers. 1-16 2-9 3-14 4-5 5-1

4. A new urgency for marine education exists today. 1-15 2-12 3-11 4-3 5-2 6-1

5. School curricula are inadequate in terms of world of water concepts. 1-17 2-15 3-7 4-6

6. Americans in general fail to appreciate the pervasive influence of the world of water in every major facet of human life.
1-15 2-12 3-10 4-5 5-1

7. Our concept of the nation must be extended to include the 200-mile economic zone, the coastal zone, and the continental shelves.
1-15 2-12 3-9 4-7 5-1 6-1

8. Marine studies should be infused into existing curricula rather than treated as separate topics. 1-24 2-9 3-6 4-3 5-1 6-1

9. Marine studies should receive adequate attention in the education of teachers of all school levels and in all school subjects.
1-21 2-13 3-9 4-1 5-1

10. Marine studies are just as important in the social sciences and humanities as they are in the natural sciences. 1-17 2-14 3-8 4-2 5-2

11. Specialized marine education for various purposes, or to meet local and regional needs, should be in addition to general studies about the world of water in the total education process.
1-14 2-7 3-13 4-5 5-3 6-1

12. Knowledge of marine careers should be part of the information guidance counselors have for advising. 1-11 2-12 3-14 4-6

13. Overall, the statement is: Too strong - About Right - 32 Too weak - 4 NA - 5 Too strong, about right - 1

14. I would give marine education, as described in the statement, a priority that is: High - 15 Moderate - 24 Low - 1 NA - 3 High, moderate - 2

15. If marine education programs are to be initiated, the level at which they should begin is: Federal - 4 State - 10 Local - 18 NA - 5 All - 2 Federal, state - 1 All, 1st maybe state and federal, then local - 1 State, local - 1 All simultaneously - 1 Whoever will supply the funds - 1

16. Regarding my own attitude about the importance of the world of water, the effect of the statement is: Significant - 21 Moderate - 13 Minor - 4 Zero - 1 NA - 6. Did the statement change your mind? Yes - 8 No - 28 NA - 9

17. To say that inland states have a stake in the world of water equal to coastal states is:
Accurate - 37 Overstated - 2 NA - 3 Accurate, overstated - 2 Understated - 1

18. As an educator, the prospect of integrating the world of water into the curricula is something I would personally: Accept - 7 Enjoy - 20 Accept and Enjoy - 11 NA - 7

19. Use of the term "marine" to embrace the <u>whole</u> world of water: Is acceptable - 4 Is troublesome - 14 Is unacceptable - 15 Needs to become more familiar - 3 NA - 5 Is troublesome to many people and needs to become more familiar - 1 Troublesome and unacceptable, rather see used World of Water or Water Education, etc. - 1 Troublesome and Unacceptable - 2

20. The best place, or places, for education about the world of water is: K-12 - 8 Continuing education - 1 NA - 4; All of these - 31 6-12, Undergraduate, and continuing education - 1

Comments and criticisms on any aspect of the statement not covered by the 20 items:

1. Document seemed to set H_2O and didn't look at it as a part of ecosystem.

2. You said it all!!

3. The statement overall is good. My main criticism is that it was permeated with emotional value judgments that distracted from the clarity of the information.

   Conference was beneficial because of contact and interaction with such a high quality of participants (not meaning myself). I found discussion very stimulating and gained a new perspective of the role of education. I will help our teachers in any way possible plan and implement such a program!

4. Overall meeting very good. Did not receive enough material in advance to complete this survey.

5. I am not sure what aspect of water education this committee feels is relevant. Are we going to educate people in marine education or channelize water.

   Did not care for keynote speaker.

6. I feel the problems we witness in our attitudes about water and water conservation cannot be cured in the curriculum of schools. The problem's solution will require an attitude change (an ethic change) which, in my opinion, will be most greatly effected by significant social crises rather than an educational curriculum.

7. The statement was much too narrow in scope and too verbose.

8. The emphasis put on coastal area, while the inner part of the continent has more critical issues concerning water.

9. We must not only bring knowledge of water up to standards of land and air -- we must surpass this level in current knowledge of all three. They are all interrelated. All are vital to human life and development.

10. The economic and social implications of water availability needs to be included.

11. I have learned much today. I did not receive the mailout so didn't know what this was to do.

12. We need regional water resource center in our state.

13. Allow Oklahoma to become a pilot leader in the Marine Education. The uniqueness of water as the world takes this for granted needs an established criterion for self-preservation.

14. The statement has a strong bias to the environment of the sea which is both unnecessary and unwarranted. I would urge a complete rewrite around the concept of the Hydrologic Cycle and its implications.

15. I think the document was overweighted towards salt water. The world of water as related to land-locked states is important, too.

16. The incorporation of the relation of a quality environment into the economic development of this nation must be stressed.

Looking Ahead

1. Would you, with some support, be interested in organizing a workshop to introduce others to the need for marine-oriented learning? Yes-30 No-1 NA-14 Comments:

    1. Would if I knew more about the subject.
    2. Through use of local teachers as resources.
    3. I would like to help (work with a committee, etc.)
    4. Assisting, yes.
    5. Maybe after I've been trained.
    6. I would be happy to participate.

2. What "tools" or resources do you believe would help you integrate marine topics into the curriculum?

    1. Local & state agencies, college profs, & film strips, movies, etc.
    2. Printed materials, units written to be incorporated in our schools.
    3. Appropriate AV materials, equipment for activities (e.g., test kits) and field trips.
    4. AV materials, test kits, field trips.
    5. I think I have sufficient resources. What I need is more training and background knowledge.
    6. In-service locally, resource personnel, field trips.
    7. More knowledge.
    8. Simply a list of resource people, agencies, etc. to serve as a guide.
    9. (1) teacher training, (2) materials, (3) money
    10. Curriculum guide.
    11. 1st money, 2nd time, 3rd resource help, 4th resource materials
    12. Better funding for equipment or materials.
    13. Water test kit.
    14. More literature, audio visual materials, and little bit of money.

15. Printed information
16. Awareness of what is now available on water--discovered many agencies while visiting in small groups.
17. Time and funds.
18. Use of people--cross section of community--people as resources.
19. Government agencies, local persons, written materials, list of resources available throughout local areas.
20. Summer workshops.
21. Soil conservation, OSU Library.
22. In-service workshop.
23. Sourcebooks.
24. Guidelines and "impact statements" for administration.
25. Water data, activity modules, lesson plans.
26. Background data on facts, speakers from agencies.
27. Lists of resources--at local,state, and federal levels (agencies, industries, etc.) for advisory or educational purposes, lists of free films available from various sources for use.
28. Workshop funding, release-time (possible use of professional days) for in-service training, redirect present non-essential (reset priorities) funded program funds into more relevant programs.

3. Would you be interested in taking part in marine education curriculum and materials development workshops? Yes-33 No-0 NA-12 Comments:

1. If not me, certainly some teachers in our system.
2. We need materials to present.
3. Or at least assist in getting the appropriate and/or interested persons involved in such a workshop.

General Information

1. What is your role in education?
Teacher-5 School Administrator-2 School Board-1 Science Teacher-22 NA-3 Other:

1. Teacher, science teacher, administrator, local and state organizations that are involved in promoting education of various segments of the population.
2. Chemistry teacher
3. Director, Oklahoma Geological Survey
4. Science coordinator
5. None
6. I am not involved in education although I am professionally (?) into water resources.

7. Math teacher.
8. Conservation Ed. Specialist, Conservation Districts
9. 6th and 7th Science teacher; K-8 Science Coordinator
10. School administrator and science teacher
11. Voluntary agency, Oklahoma Water, Inc.
12. State Natural Resources Administrator

2. If you have had personal experience with some major aspect of the world of water, what kind was it?

1. Time in the Navy
2. Regulation
3. None
4. In depth pollution study of local creek
5. Developing a unit on protection of the Illinois
6. Field trips to local rivers
7. In research in tap H_2O
8. Fish a lot. Am aware of the quality of the lake water in my area
9. Work
10. Teach Environmental Quality Unit with emphasis on H_2O
11. Biology
12. Farmer
13. Graduate course
14. Fresh H_2O ecology; Recreation
15. Member Oklahoma Scenic River Association
16. Recreational
17. Teaching water testing technique and biological aquatic sampling
18. Bathing, teaching water ecology activities, sailing, etc.
19. Being a geologist
20. Watershed protection
21. Have floated the Illinois and Arkansas River, etc.
22. Field experiences--water sampling, etc.
23. Life itself and teaching and learning
24. Swimming
25. Aquatic biology training; "conservation" group involvement
26. Analysis of water (chemical)
27. Water resources development
28. Hydrologist for 28 years
29. Spring and artesian wells

3. Do you make a point of watching TV programs about the oceans? If so, which ones? Jacques Cousteau-8 Yes-3 No-8 NA-10

1. Yes, all I know about
2. I rarely watch TV
3. The Cousteau Series, National Geographic Specials
4. Cousteau's series, etc. Anything that ties into general knowledge for ecology, earth science, etc.
5. NOVA, National Geographic, etc.
6. Cousteau - NOVA
7. Specials (such as National Geographic, NOVA, general)

8. National Geographic Specials
9. NOVA series and anything else concerning water
10. Whatever comes on
11. Cousteau, NOVA, etc.
12. Most of what has been shown in the last year I've seen. The ones my kids speak about are Cousteau Specials.
13. PBC
14. All when possible (National Geographic)
15. Yes, all specials (National Geographic, Jacques Cousteau and others)
16. J. Cousteau, NOVA

4. If you listed programs in item 3, what is your impression of their scientific integrity, authenticity and educational value? NA-25

1. Those that I watch are scientifically authentic.
2. Generally well designed to educate general public.
3. Good, but a little ecologically slanted.
4. Great
5. Good.
6. Seem very factual--extremely educational
7. Excellent
8. Somewhat dramatic and too much anthropomorphism.
9. Very good.
10. Varies with the program
11. Good, interesting, educational
12. Very good.
13. Question some aspects, but have dramatic quality.
14. OK
15. Scientific integrity fair to good, authenticity good, educational value fair to good.
16. Fantastic
17. OK!!
18. Good
19. Pretty good
20. Excellent

5. Have you ever used current events, magazine articles, or similar "swipes" about the world of water to spice up a class or to emphasize a point in the curriculum? Yes-26 No-2 NA-12

1. Some, but rarely
2. To emphasize a point with teachers
3. In terms of "fresh water" concepts and water usage (conservation)
4. Ranger Rick
5. Yes, plus materials from Soil Conservation Services and Oklahoma Water, Inc.

6. Where were you brought up,where do you work? (city and state)
Oklahoma City-2 Tulsa-3 NA-5

1. Western Oklahoma
2. Hugo, Oklahoma
3. Wellington, Kansas and Canyon, Texas - Okmulgee, Oklahoma
4. Dallas, Texas - Oklahoma City
5. Oklahoma - Oklahoma City
6. Memphis, Texas - Clinton, Oklahoma
7. Nowata, Oklahoma - Oologah, Oklahoma
8. Davis, Durant, Oklahoma - Oklahoma City
9. Chickasha, Oklahoma - Sapulpa, Oklahoma
10. Enid, Oklahoma - Guymon, Oklahoma
11. SW Oklahoma
12. Tahlequah Junior High School
13. Oklahoma - Cement
14. Perryton, Texas, Texas Panhandle - Stillwater, Oklahoma
15. Pontotoc County
16. Tulsa - Oklahoma City
17. Crescent, Oklahoma - Oklahoma City
18. Rural Northwestern Oklahoma
19. Enid, Oklahoma
20. Talihina, Oklahoma - EOCS, Wilburton, Oklahoma
21. Kansas City, Kansas - Enid, Oklahoma
22. Mangum (SW) Oklahoma - Kingfisher, Oklahoma
23. Colorado & Miami (OK) - Oklahoma City
24. Bartlesville, Oklahoma City, Oklahoma - State of Oklahoma
25. Sidney, Nebraska - Cleveland, Oklahoma
26. Stillwater, Oklahoma - Glencoe, Oklahoma
27. West Texas, Southern Oklahoma - Oklahoma City
28. Guthrie, Oklahoma - Tulsa, Oklahoma
29. Tulsa, Oklahoma - Keystone, Oklahoma
30. E. Kansas farm - NEOSU, Tahlequah, Oklahoma
31. Blackwell, Oklahoma - Altus, Oklahoma
32. Ranch in W. Texas - Norman, Oklahoma
33. SE Oklahoma - Mannford, Oklahoma
34. Oklahoma - Oklahoma City, Oklahoma
35. Cherokee, Oklahoma - Cherokee, Oklahoma

7. Some Statistics:

Males-29 Females-12 NA-4
Age: 20-30=7 30-40=18 40-50=9 50-60=3 60+=2 30=1
Over 21=1 NA=4
Education Level: BS/BA-12 MS/MA-24 Ph.D.-4 Ed.D.-1 NA-4

APPENDIX D

Group Responses to Oklahoma's Water Education:

Needs
Resources
Goals and Priorities
Summary of Goals and Priorities
Action Plans

APPENDIX D

1. Group Responses to Oklahoma's Water Education Needs

   A. Ethics

      1. An environmental ethic which includes the development of water resources with a regional, national, and continental responsibility toward water use.

      2. Water conservation as each individual's responsibility.

      3. Concern for man's impact on water quality.

      4. Developing an open mind toward the significance of "change".

      5. Developing an appreciation for the intrinsic aesthetic value of water.

   B. Economics

      1. Economic importance of water relative to environmental concerns.

      2. The potential and limitations of water as a resource.

   C. Concepts

      1. Social

         a. The impact of water on our culture. Its use and the consequences of poor management on the quality of life.

         b. The effects of ground and surface water distribution on the social and economic patterns in Oklahoma.

         c. Water distribution problems--interrelationship between Eastern and Western Oklahoma.

         d. Political involvement of educators and the general public for sound water policies.

         e. Procedures for "grass roots" input to political decision making.

         f. Increase the level of public awareness as to the relationship between water quality and quantity and the quality of life.

2. Scientific

   a. Chemical, physical and biological factors.

   b. Natural distribution of ground water.

   c. Natural distribution of surface water.

   d. The hydrologic cycle and its relationship to the ecology of Oklahoma

   e. Alterations of natural distribution of ground and surface water.

D. Teacher and Administrator Assistance

   1. Creation of Resource Centers

   2. Develop cadre of resource personnel

   3. Procure materials and equipment for classroom use

   4. Teacher education, i.e., intensive interdisciplinary K-12 workshops

   5. Printed directory of human and material resources

2. Group Responses to Oklahoma's Resources

State

Oklahoma Water, Inc.
Oklahoma Water Resources Board
Oklahoma Conservation Commission
Pollution Control Board
Park Service
Bureau of Outdoor Education
Oklahoma State Dept. of Education
NOAA
Oklahoma Biological Survey
Oklahoma Wildlife Federation
Ornithological Society
County and State Health Dept.
Department of Commerce
State Legislature Education Comm.
Local School System Personnel
Oklahoma Science and Arts Foundation
Science Resource Corporation
Kerr Water Research Center, Ada
Universities, OU Severe Storms Inst.
OU Water Resources Inst.
OSU Geology Department
OSU Civil Engineering Dept.
OSU Water Resources Research Lab
OSU Extension Service

Federal

Bureau of Land Management
Corps of Engineers
Soil Conservation Service
U.S.D.A. Forest Service
Bureau of Reclamation
NASA
Department of Interior
1. National Parks Service
2. Wild & Scenic River System
3. Bureau of Fisheries and Wildlife
4. U.S. Geological Survey
Water Quality Labs, i.e., NIPAK
Environmental Protection Agency
Coast Guard
National Sea Grant Program

Private

Sierra Club
4-H Association
Boy and Girl Scouts

Potential Resources

Exxon
Phillips Petroleum
Weyerhauser
Kerr
Noble
Ford
Rockefeller
NSF funds for economic feasibility study of areas with water problems

3. Group Responses to Oklahoma's Goals and Priorities

Priority 1

1. Develop regional outdoor environmental centers for the purpose of (1) teacher training (2) dissemination of resource information (3) increasing teacher and student interaction around "hands on" activities.

1. Public awareness for the purpose of funding.

1. Development of an interdisciplinary curriculum on water resources.

1. Design and conduct workshops and teacher inservice programs. Use educational media to publicize programs offered to the public and educators.

1. Develop an ethic in regard to water from the State Department of Education level down to the local classroom teacher and community leaders.

1. Develop a series of interdisciplinary curriculum guides on water. (K-3, 4-6, 7-9, 10-12, etc.)

Priority 2

2. Set up a resource center to be used as a clearing house for distributing materials from all resources.

2. Develop materials and equipment for implementation for water resources education.

2. Identify resource people and materials.

2. Develop a water curriculum guide for all grades (K-12) including all subjects and their relationship to water.

2. Recreational areas should be utilized for water information and activities. One example is the Cedar Lake project during the summer of 1977.

2. Create well-informed leadership and method for dissemination of current information.

Priority 3

3. Establishment of Environmental Education Degree at college level.

3. Training of teachers in water resources content and methodology.

3. Training and dissemination in the field.

3. Develop an extensive resource band including local resource personnel, available films, books, etc.

3. Preservice training at the university level as a student.

3. Determine critical short and long range issues for the state and allocate resources for in-depth seminars involving a cross section of the communities

4. Summary of Goals and Priorities

The following summarizes the responses of the six task force groups. Each group submitted at least three water resource education goals in order of priority. Priority levels were weighted by the frequency of occurrence in each level to determine overall ranking.

A. Priority One: Regional Centers

Regional water resources educational centers to be established for the purpose of:

1. Teacher training in classroom and field activities.
2. Clearinghouse for the dissemination of human and material resources to school and community.
3. Development of regional field study sites.
4. Coordination of a traveling water resources education program.

B. Priority Two:

Design and conduct teacher education programs that include:

1. Workshops and teacher inservice programs.
2. Leadership training for persons capable of conducting additional workshops.
3. Training in both content and methodology as applied to the multidisciplinary study of water.
4. Advanced degree programs in environmental education.
5. Greater attention to water resource education at the undergraduate level.

C. Priority Three:

Develop a series of curriculum guides for school and community groups that are:

1. Multidisciplinary, i.e., involve social sciences, economics, mathematics, music, art, science, physical education, and humanities.

2. Appropriate for grades kindergarten through twelve.

D. Priority Four:

Consider the ethics associated with governmental, industrial, and individual development and use of water resources. What moral obligations exist that might be espoused by persons ranging from the State Department of Education to classroom teachers and community leaders.

1. The rationale for increased funds.
2. Current and possible future issues involving water resources.
3. The need for public support and input into the decision making process concerning water as it relates to the total well-being and quality of life for all Oklahoma.

5. Action Plans

Summary of Actions Leading to Goal Achievement

A. Identify a site at which a pilot study can be conducted for the purpose of water resource study. The study site would include:

1. One full-time person to coordinate water education resources, both human and material.
2. An outdoor study site for student as well as teacher training.
3. Provision for intensive study at the site for extended periods of time, i.e., housing, food, and instructional materials for a week or more.
4. Staff resources drawn from across the state.
5. The development of curriculum guides.

B. Identify the best resource persons in Oklahoma and have this group present a proposal to the Oklahoma Legislature and other funding agencies. The Oklahoma Water Education Steering Committee would serve as task force directors.

C. Teacher Training

1. Teachers and administrators should be involved in intensive training that includes a "temporary system" with "forward linkage" to the teacher's respective school system. Training program to be patterned after previous cooperative programs conducted at the OU-OSU Geology Field Camp, Canon City, Colorado and the Goddard Youth Camp, Sulphur, Oklahoma.
2. Educators from inland states should study at a salt water marine education site along the coast. Study should also be conducted on field trips to:

    a. desalination plants
    b. city water treatment plants
    c. channelization projects
    d. major water sheds
    e. swamps and wetlands
    f. various fresh water sites, i.e., ponds, lakes, streams, rivers, etc.

3. Study should include:

    a. sensory awareness
    b. curriculum
    c. material and human resources
    d. content: concepts and principles
    e. laboratory and field techniques and equipment

4. Local communities should be aware of and involved in the implementation of action plans developed by their teacher and administrator representatives participating in the training program.

5. It is imperative that the public school administrators, particularly the building principal, participate in training programs. The administrator's understanding and support for water resource education determines to a large degree the success of implementing teacher-initiated programs.
6. Procedures should be developed to facilitate teacher participation in training programs.
    a. Released time for teachers funded by local school systems and/or state legislature. At the state level, funding might be similar to that used in jury duty.
    b. A greater variety of training models currently in use, i.e., one day workshops
    c. Training sites should be located at various geographic locations.
    d. More liberal public school policy toward released time for the purpose of teacher training.
    e. Develop a strategy for announcing training programs to teachers. Intensive publicity.

D. The Oklahoma Science Teachers Association to act as sponsor for continuation of this type of conference.

E. The Marine Education Steering Committee should continue to function in order to pursue the goals identified at this conference.

F. Identify, organize and compile a directory of local, state, and regional information sources currently in existence, i.e., free films, resource guide, literature dealing with aesthetic and psychological impact of water on human beings.

G. Conduct research to document that marine education contributes to the total education of the student.

H. Collect and distribute tried and tested water education curriculum materials.

I. Compile inventory of museums, libraries, exhibits, and demonstrations relative to water education.

APPENDIX E

Materials Distributed to Participants

LIST OF PUBLICATIONS INCLUDED IN PACKET

U.S. Department of Interior - Geologic Survey (9 pamphlets)

1. Water Conservation
2. The hydrologic cycle
3. Rain - A Water Resource
4. Natural Steam for Power
5. Water Use in the United States
6. U.S. Geological Survey Publications on Floods
7. What is Water?
8. Water and Industry
9. Sources of Information and Services of the U.S. Geological Survey

EDP Publication Services (1 pamphlet)

1. "Ekokits"

Various Sponsors (1 pamphlet)

1. We're through wishin'

U.S. Energy Research and Development Administration (ERDA) (1 pamphlet)

1. Heated water from power plants

National Water Well Associations (4 pamphlets)

1. Water for America
2. America's Priceless Ground Water Resource
3. Ground Water Pollution Control
4. When you need a water well

Reader's Digest (1 pamphlet)

1. Can our rivers stand the heat?

Conservation and Environmental Studies Center (CESC) (1 pamphlet)

1. CESC Curriculum Collection

National Wildlife Federation (2 pamphlets)

1. Estuary - What a Crazy Place
2. Wetlands and Wildlife

Environmental Protection Agency (EPA) (2 pamphlets)

1. A Drop to Drink
2. Is Your Drinking Water Safe?

National Science Teachers Association (NSTA) (1 pamphlet, 1 sheet)

1. The professional link between science, education and society.
2. NSTA Publications

Outdoor Biology Instructional Strategies (OBIS) (4 pamphlets, 1 sheet)

1. The OBIS Story
2. OBIS Order Form
3. Water Striders
4. Water Breathers
5. The OBIS Newsletter

U.S. Department of Agriculture (USDA) (1 sheet)

1. Forests and Water

Primary Environmental Education Project (PEEP) (1 sheet)

1. PEEP price list information

Biological Sciences Curriculum Study (BSCS) (1 booklet)

1. The Environment

Individualized Science Instructional System (ISIS) (2 pamphlets, 1 book)

1. Solutions to Difficulties and Challenges in Secondary School Science
2. ISIS Newsletter #4
3. ISIS Newsletter #5

Articles from (see attached list)

The Science Teacher (NSTA)
The Journal of Geological Education (NAGE)
Science and Children (NSTA)

Oklahoma Geological Survey

1. Educational Publ. No. 1, Geology and Earth Resources of Oklahoma (atlas of maps and sections)
2. Geology, Science and Profession (American Geological Institute Career Pamphlet)
3. List of Available Publications.

PUBLICATIONS ON DISPLAY

Individualized Science Instructional System (ISIS) (1 booklet)

1. Water

National Science Teachers Association (NSTA)

1. Factsheets (16)
2. Advance Program Information for NSTA Area Conventions

Sample copies:

1. Science Teacher
2. Science and Children
3. Journal of College Science Teaching

LIST OF ARTICLES INCLUDED IN PACKET
From

The Science Teacher (TST), The Journal of Geological Education (JGE), Science and Children (SAC)

Contents	Type
1. Oceanography in a Swimming Pool (SAC)	Activity
2. What Does the Tide Do? (SAC)	Information
3. Water Hardness (SAC)	Activity
4. The Blue Water (SAC)	Activity
5. Lake Erie Is Alive and Well (TST)	Information
6. Waste Water Management (TST)	Information
7. Measuring Turbidity with Two-way Secchi Disk (TST)	Activity
8. Inexpensive Ground Water Model for Use by Beginning and Advanced Students (JGE)	Demonstration
9. Tempests in a Jar (SAC)	Activity
10. Adopt a Stream (SAC)	Activity
11. Water Drops and the Five-year Old (SAC)	Activity
12. Stepping into Water and Mud to Move with River Rhythms (TST)	Activity
13. Aquaria on a Classroom Budget (TST)	Activity
14. Oil and Water Don't Mix (TST)	Demonstration
15. Which Freezes First, Hot or Cold Water (TST)	Activity
16. Exploring Pond Water (SAC)	Activity
17. Our Coastal Waters: An Endangered Zone (TST)	Information
18. Oceans of Power? (JGE)	Information